
Space Weather Technical Forecast

Issued on Monday, 17 June 2024 at 00:08 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales <https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales>

We are aware of some ongoing disruption to data flow from the Space Weather Prediction Centre. As a result, our Alerts and Warnings service may experience delays or contain incomplete data.

Space Weather Forecast Headline: Isolated M-class flares (R1-R2 radio blackouts) likely throughout.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low, with peak activity in the last 24hrs a C7.1 flare peaking at 15/2323UTC from AR3712. This region is approaching the centre of the visible disc to the south.

There are currently seven sunspots on the disc. The most complex groups all currently lie in the eastern solar hemisphere but are approaching the centre disc, and foremost amongst these is AR3712. This region contains multiple small delta spots, and has continued to see proliferation of its intermediate spots as well as increasing in overall area in recent hours. Also of note is AR3716 in the northeast, which has also developed intermediate spots to become a compact group and continues to grow in size. The other regions on the disk appear generally stable or are in decline.

No Earth directed CMEs were in evidence in available imagery.

Solar Wind / Geomagnetic Activity: Solar winds were mostly slightly elevated, as observed by ACE at L1, initially averaging around 380-420 km/s on a declining trend following a CME arrival on the 15 June, however increased to around 440-460 km/s following suspected connection with CH45/+ at around 1430 UTC. Density was at below average to average levels. The Interplanetary Magnetic Field (IMF), Bt, was weak to moderate, with a maximum value of 10nT at 1930 UTC. The North-south component oscillated between +9 and -8nT. Phi angle was mostly negative (towards the Sun) at first, but oscillated between positive (away from the sun) and negative during the second half of the day, finishing positive. The resultant geomagnetic activity was largely quiet to unsettled (Kp1-3) but became Active (Kp4) for 16/1800-2100 period.

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux observed by GOES18 remained at resting background levels.

High energy electron flux (greater than 2MeV) observed by GOES16 was mainly at Normal Background levels, with the associated 24-hour fluence well below Active. Observed fluence at 17/0001UTC was 1.0e6 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Isolated M-class flares are likely, with a slight chance of isolated X-flares. This risk primarily from AR3712.

Solar Wind / Geomagnetic Activity: The solar wind is currently slightly elevated at around 450 km/s, likely from connection with CH45/+. Slightly elevated solar wind speeds of 400-500 km/s are expected to continue for Day 1 (17 June) and much of Day 2 (18 June), before declining back to

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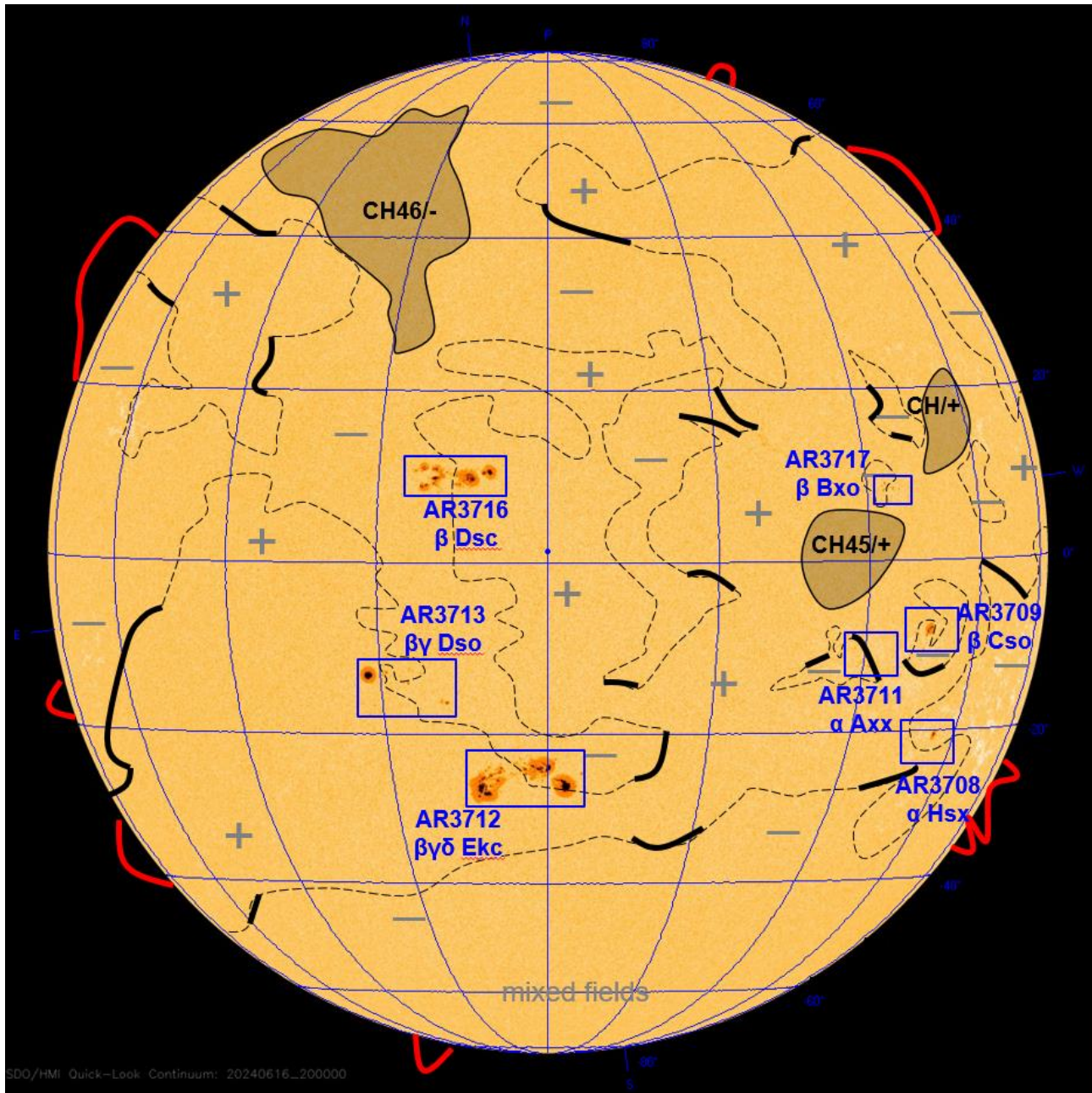
background from later Day 2 and into Day 3 (19 June).

Geomagnetic activity is expected to remain at largely quiet to unsettled levels (Kp1-3) for much of the period. During days 1-2 interludes of Active (Kp4) levels are expected, with only a slight chance of some isolated G1/Minor Storm intervals (Kp5) due to connection with the aforementioned coronal hole.

Energetic Particles / Solar Radiation: High energy proton flux is expected to remain at Background levels, with just a slight but increasing chance of reaching S1 levels following any significant flares.

High energy electron flux is forecast to persist at predominantly Background levels, and the associated 24-hour fluence is expected to remain below the Active threshold.

Figure 1. Solar Analysis Valid 16/2000 UTC.



Key: Filament — , Prominence — , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Geomagnetic Storms:

No CMEs currently feature in the forecast.

The solar wind is currently slightly elevated at around 450 km/s, likely from connection with CH45/+. This feature is not recurrent and is therefore something of an unknown quantity. However due to our proximity to the solstice and CH45's limited visual (AIA211) size, it is not expected to have too much of a significant impact. Slightly elevated solar wind speeds of 400-500 km/s are expected to continue for Day 1 (17 June) and much of Day 2 (18 June), before declining back to background from later Day 2 and into Day 3 (19 June).

Geomagnetic activity is expected to remain at largely quiet to unsettled levels (Kp1-3) for much of the period. During days 1-2 interludes of Active (Kp4) levels are expected, with only a slight chance of some isolated G1/Minor Storm intervals (Kp5) due to connection with the aforementioned coronal hole.

Geo-Magnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	15	10	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Geomagnetic Activity - Earthbound Coronal Mass Ejections

Nil.

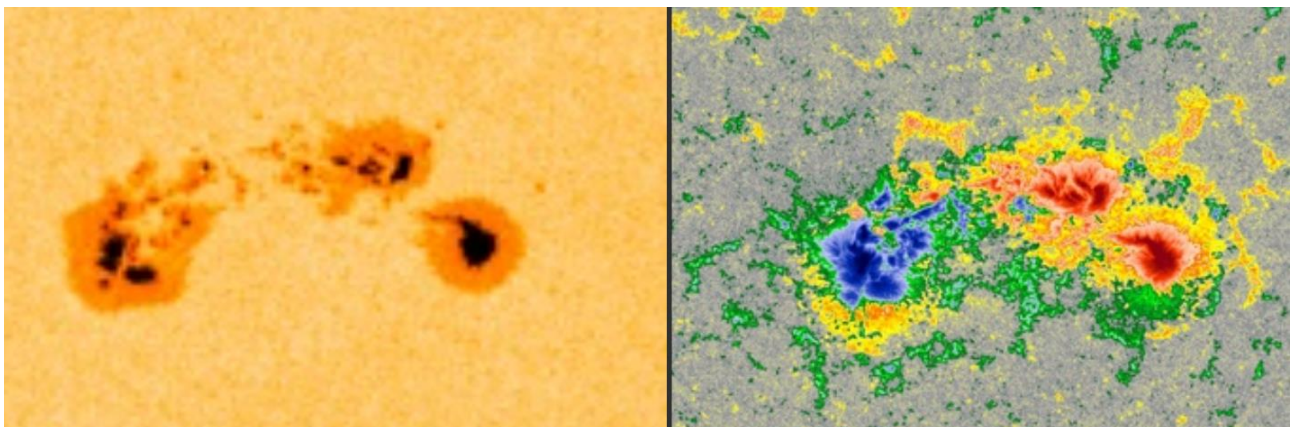
Radio Blackouts - X-Ray Flares:

The chances of significant flares looks to be primarily tied to the large AR3712, and to a lesser extent AR3716, with these two regions undergoing significant growth phases in recent days. Both of these sunspot groups now present as having 'compact' Zurich classifications, while AR3712 retains multiple small Mt Wilson delta spot. Other regions on the disk appear generally stable or are in decline, with the majority of flare activity in the past 24 hours emanated from one of these three regions, particularly AR3712.

Isolated M-class flares are viewed as likely going forward, with a slight chance of isolated X-flares primarily from AR3712. No significant sunspot regions are expected to either arrive or depart the visible disk during the period, and the risk is therefore held constant for now, pending further evolutions.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	70	70	70	70
Very Active	R3 to R5 X Class	No	10	10	10	10

Figure 2: Latest HMIIF/HMIBC imagery for AR3712, small delta spot regions visible



Solar Radiation Storms - (High Energy Protons):

High energy proton flux is at background levels. In terms of the future risk, the most significant regions on the visible disc are currently approaching centre-disc. The daily risk of surpassing S1 is therefore low but shows a slight increase towards the end of the period as AR3612 begins to move into a geo-effective position in the western hemisphere to cause a proton response from Day 2 (18 Jun).

Radiation Storms	Level ($\text{cm}^{-2} \text{sr}^{-1} \text{s}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq \text{S1}$	No	10	20	20	20
Very Active	$\geq \text{S3}$ *	No	1	5	5	5
* S3 $\geq 10 \text{ MeV} \geq 1000 \text{ pfu}$ and / or $\geq 50 \text{ MeV} \geq 10 \text{ pfu}$. (pfu = $\text{cm}^{-2} \text{sr}^{-1} \text{s}^{-1}$)						

High Energy Electrons Event ($\geq 2 \text{ MeV}$):

The high energy electron flux is expected to persist at mainly Background levels for much of this period, although some diurnal Moderate flux values are likely. This particularly later in the period following enhancement provided by positive coronal hole influence into the period.

The associated 24-hour fluence is expected to remain below the Active threshold ($1\text{e}8$ integrated pfu) but with a rising trend possible later in the period. MOSWOC REFM considered to provide reasonably good guidance in the near term.

GEO Electron Environment	Level ($\text{cm}^{-2} \text{sr}^{-1} \text{day}^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	$\geq 2 \text{ MeV}$ $\geq 1 \times 10^8$	No	1	1	10	10
Very Active	$\geq 2 \text{ MeV}$ $\geq 1 \times 10^9$	No	1	1	1	1

Figure 3: Latest MOSWOC REFM output

